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TITLE: METHOD AND SYSTEM FOR MANAGING WIRELESS NETWORK INFORMATION COLLECTION UTILIZING A TELEMATICS UNIT

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METHOD AND SYSTEM FOR MANAGING WIRELESS NETWORK INFORMATION COLLECTION UTILIZING A TELEMATICS UNIT

FIELD OF THE INVENTION

This invention relates generally to wireless communications with a mobile vehicle. More specifically, the invention relates to a method and system for managing wireless network information collection utilizing a telematics unit within a telematics equipped mobile vehicle.

BACKGROUND OF THE INVENTION

The opportunity to utilize wireless features in a mobile vehicle is ever increasing as the automobile is being transformed into a communications and entertainment platform as well as a transportation platform. Wireless features include wireless vehicle communication, networking, maintenance and diagnostic services for a mobile vehicle.

Typically, conventional wireless systems within mobile vehicles (e.g. telematics units) provide voice communication. Recently, these wireless systems have been utilized to update systems within telematics units, such as, for example radio station presets. Similar to other conventional wireless systems, telematics units within mobile vehicles are required to regularly register with the mobile vehicle communication system (MVCS). This registration is called a registration request. The registration request notifies the MVCS that the telematics unit is operational and is operating within a specified portion of the MVCS.

Additionally, networking within the MVCS utilizing short-distance communication protocols has become available and an increasing useful part of the telematics package.

The present invention advances the state of the art.

SUMMARY OF THE INVENTION

One aspect of the invention includes a method for wireless network data collection utilizing a telematics unit within a mobile vehicle communication system. The method includes detecting at least one wireless short-distance communication network identification signal, generating wireless network information based on the at least one detected wireless network identification signals, and communicating the generated wireless network information to a service provider.

In accordance with another aspect of the invention, a computer readable medium storing a computer program includes: computer readable code for detecting at least one wireless short-distance communication network identification signal; computer readable code for generating wireless network information based on the at least one detected wireless network identification signals; and computer readable code for communicating the generated wireless network information to a service provider.

In accordance with yet another aspect of the invention, a system for operating a telematics unit within a mobile vehicle is provided. The system includes means for detecting at least one wireless short-distance communication network identification signal. Means for generating wireless network information based on the at least one detected wireless network identification signals is provided. Means for communicating the generated wireless network information to a service provider is also provided.

The aforementioned, and other features and advantages of the invention will become further apparent from the following detailed description of the presently preferred embodiments, read in conjunction with the accompanying drawings. The detailed description and drawings are merely illustrative of the invention rather than limiting, the scope of the invention being defined by the appended claims and equivalents thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates an operating environment for implementing wireless communication within a mobile vehicle communication system;

FIG. 2 is a block diagram of telematics based system in accordance with an embodiment of the present invention; and

FIG. 3 is a flow diagram of one embodiment of a method of managing wireless network information collection utilizing a telematics unit, in accordance with the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates one embodiment of system for data transmission over a wireless communication system, in accordance with the present invention at **100**. Mobile vehicle communication system (MVCS) **100** includes a mobile vehicle communication unit (MVCU) **110**, a vehicle communication network **112**, a telematics unit **120**, one or more wireless carrier systems **140**, one or more short-distance communication systems **141**, one or more communication networks **142**, one or more land networks **144**, one or more client, personal or user computers **150**, one or more web-hosting portals **160**, and one or more call centers **170**. In one embodiment, MVCU **110** is implemented as a mobile vehicle equipped with suitable hardware and software for transmitting and receiving voice and data communications. MVCS **100** may include additional components not relevant to the present discussion. Mobile vehicle communication systems and telematics units are known in the art.

MVCU **110** may also be referred to as a mobile vehicle throughout the discussion below. In operation, MVCU **110** may be implemented as a motor vehicle, a marine vehicle, or as an aircraft. MVCU **110** may include additional components not relevant to the present discussion.

MVCU **110**, via a vehicle communication network **112**, sends signals to various units of equipment and systems (detailed below) within MVCU **110** to perform various functions such as unlocking a door, opening the trunk, setting personal comfort settings, and calling from telematics unit **120**. In facilitating interactions among the various communication and electronic modules, vehicle communication network **112** utilizes network interfaces such as controller-area network (CAN), International Organization for Standardization (ISO) Standard 9141, ISO Standard 11898 for high-speed applications, ISO Standard 11519 for lower speed applications, and Society of Automotive Engineers (SAE) Standard J1850 for high-speed and lower speed applications. Communication network **112** is also referred to as a communication bus.

MVCU **110**, via telematics unit **120**, sends to and receives radio transmissions from wireless carrier system **140**. Wireless carrier system **140** is implemented as any suitable system for transmitting a signal from MVCU **110** to communication network **142**.

Telematics unit **120** includes a digital signal processor (DSP) **122** connected to a wireless modem **124**, a global positioning system (GPS) unit **126**, an in-vehicle memory **128**, a microphone **130**, one or more speakers **132**, short-distance communication module **134**, and an embedded or in-vehicle mobile phone **134**. In other embodiments, telematics unit **120** may be implemented without one or more of the above listed components, such as, for example speakers **132**. Telematics unit **120** may include additional components not relevant to the present discussion.

In one embodiment, DSP **122** is implemented as a microcontroller, controller, host processor, or vehicle communications processor. In an example, DSP **122** is implemented as an application specific integrated circuit (ASIC). In another embodiment, DSP **122** is implemented as a processor working in conjunction with a central processing unit (CPU) performing the function of a general purpose processor. GPS unit **126** provides longitude and latitude coordinates of the vehicle responsive to a GPS broadcast signal received from one or more GPS satellite broadcast systems (not shown). In-vehicle mobile phone **134** is a cellular-type phone, such as, for example an analog, digital, dual-mode, dual-band, multi-mode or multi-band cellular phone.

Wireless modem **124** includes hardware and software for sending and receiving (detailed in **FIG. 2** below) short-distance communications to and from short-distance communication system **141**. Examples of short-distance communications include a radio frequency identification data (RFID), short message service signal, an IEEE 802.11 standard compliant signal, or a Bluetooth compliant signal. In one embodiment and illustrated in **FIG. 1**, wireless modem **124** is located separate from DSP **122**. In another embodiment, wireless modem **124** is located within DSP **122**. Short-distance communication system **141** is implemented as any suitable system for transmitting a signal, such as described above, from MVCU **110** to communication network **142**. In one embodiment, short-distance communication system **141** is a wireless fidelity, called a "wi-fi", network located within a business, such as, for example a coffee shop, a café, and the like.

DSP **122** executes various computer programs that affect programming and operational modes of electronic and mechanical systems within MVCU **110**. DSP **122** controls communications (e.g. call signals) between telematics unit **120**, wireless carrier system **140**, and call center **170** as well as communications (e.g. call signals) between telematics unit **120**, short-distance communication system **141** via wireless modem **124**, and call center **170**. In one embodiment, a voice-recognition application is installed in DSP **122** that can translate human voice input through microphone **130** to digital signals. DSP **122** generates and accepts digital signals transmitted between telematics unit **120** and a vehicle communication network **112** that is connected to various electronic modules in the vehicle. In one embodiment, these digital signals activate the programming mode and operation modes, as well as provide for data transfers. In this embodiment, signals from DSP **122** are translated into voice messages and sent out through speaker **132**.

Communication network **142** includes services from one or more mobile telephone switching offices and wireless networks. Communication network **142** connects wireless carrier system **140** and short-distance communication system **141** to land network **144**. Communication network **142** is implemented as any suitable system or collection of systems for connecting wireless carrier system **140** and short-distance communication system **141** to MVCU **110** and land network **144**.

Land network **144** connects communication network **142** to client computer **150**, web-hosting portal **160**, and call center **170**. In one embodiment, land network **144** is a public-switched telephone network (PSTN). In another embodiment, land network **144** is implemented as an Internet protocol (IP) network. In other embodiments, land network **144** is implemented as a wired network, an optical network, a fiber network, other wireless networks, or any combination thereof. Land network **144** is connected to one or more landline

telephones. Communication network **142** and land network **144** connect wireless carrier system **140** and short-distance communication system **141** to web-hosting portal **160** and call center **170**.

Client, personal or user computer **150** includes a computer usable medium to execute Internet browser and Internet-access computer programs for sending and receiving data over land network **144** and optionally, wired or wireless communication networks **142** to web-hosting portal **160**. Personal or client computer **150** sends user preferences to web-hosting portal through a web-page interface using communication standards such as hypertext transport protocol (HTTP), and transport-control protocol and Internet protocol (TCP/IP). In one embodiment, the data includes directives to change certain programming and operational modes of electronic and mechanical systems within MVCU **110**.

In operation, a client utilizes computer **150** to initiate setting or re-setting of user-preferences for MVCU **110**. In an example, a client utilizes computer **150** to provide radio station presets as user-preferences for MVCU **110**. User-preference data from client-side software is transmitted to server-side software of web-hosting portal **160**. User-preference data is stored at web-hosting portal **160**.

Web-hosting portal **160** includes one or more data modems **162**, one or more web servers **164**, one or more databases **166**, and a network system **168**. Web-hosting portal **160** is connected directly by wire to call center **170**, or connected by phone lines to land network **144**, which is connected to call center **170**. In an example, web-hosting portal **160** is connected to call center **170** utilizing an IP network. In this example, both components, web-hosting portal **160** and call center **170**, are connected to land network **144** utilizing the IP network. In another example, web-hosting portal **160** is connected to land network **144** by one or more data modems **162**. Land network **144** sends digital data to and from modem **162**, data that is then transferred to web server **164**. Modem **162** may reside inside web server **164**. Land network **144** transmits data communications between web-hosting portal **160** and call center **170**.

Web server **164** receives user-preference data from user computer **150** via land network **144**. In alternative embodiments, computer **150** includes a wireless modem to send data to web-hosting portal **160** through a wireless communication network **142** and a land network **144**. Data is received by land network **144** and sent to one or more web servers **164**. In one embodiment, web server **164** is implemented as any suitable hardware and software capable of providing web services to help change and transmit personal preference settings from a client at computer **150** to telematics unit **120** in MVCU **110**. Web server **164** sends to or receives from one or more databases **166** data transmissions via network system **168**. Web server **164** includes computer applications and files for managing and storing personalization settings supplied by the client, such as, for example, door lock/unlock behavior, radio station preset selections, climate controls, custom button configurations and theft alarm settings. For each client, the web server potentially stores hundreds of preferences for wireless vehicle communication, networking, maintenance and diagnostic services for a mobile vehicle.

In one embodiment, one or more web servers **164** are networked via network system **168** to distribute user-preference data among its network components such as database **166**. In an example, database **166** is a part of or a separate computer from web server **164**. Web server **164** sends data transmissions with user preferences to call center **170** through land network **144**.

Call center **170** is a location where many calls are received and serviced at the same time, or where many calls are sent at the same time. In one embodiment, the call center is a telematics call center, facilitating communications to and from telematics unit **120** in MVCU **110**. In an example, the call center is a voice call center, providing verbal communications between an advisor in the call center and a subscriber in a mobile vehicle. In another example, the call center contains each of these functions. In other embodiments, call center **170** and web-hosting portal **160** are located in the same or different facilities.

Call center **170** contains one or more voice and data switches **172**, one or more communication services managers **174**, one or more communication services databases **176**, one or more communication services advisors **178**, and one or more network systems **180**.

Switch **172** of call center **170** connects to land network **144**. Switch **172** transmits voice or data transmissions from call center **170**, and receives voice or data transmissions from telematics unit **120** in MVCU **110** through wireless carrier system **140**, communication network **142**, and land network **144**. Switch **172** receives data transmissions from and sends data transmissions to one or more web-hosting portals **160**. Switch **172** receives data transmissions from or sends data transmissions to one or more communication services managers **174** via one or more network systems **180**.

Communication services manager **174** is any suitable hardware and software capable of providing requested communication services to telematics unit **120** in MVCU **110**. Communication services manager **174** sends to or receives from one or more communication services databases **176** data transmissions via network system **180**. Communication services manager **174** sends to or receives from one or more communication services advisors **178** data transmissions via network system **180**. Communication services database **176** sends to or receives from communication services advisor **178** data transmissions via network system **180**. Communication services advisor **178** receives from or sends to switch **172** voice or data transmissions.

Communication services manager **174** provides one or more of a variety of services including enrollment services, navigation assistance, directory assistance, roadside assistance, business or residential assistance, information services assistance, emergency assistance, and communications assistance. Communication services manager **174** receives service-preference requests for a variety of services from the client via computer **150**, web-hosting portal **160**, and land network **144**. Communication services manager **174** transmits user-

preference and other data to telematics unit **120** in MVCU **110** through wireless carrier system **140**, communication network **142**, land network **144**, voice and data switch **172**, and network system **180**. Communication services manager **174** stores or retrieves data and information from communication services database **176**. Communication services manager **174** may provide requested information to communication services advisor **178**.

In one embodiment, communication services advisor **178** is implemented as a real advisor. In an example, a real advisor is a human being in verbal communication with a user or subscriber (e.g. a client) in MVCU **110** via telematics unit **120**. In another embodiment, communication services advisor **178** is implemented as a virtual advisor. In an example, a virtual advisor is implemented as a synthesized voice interface responding to requests from telematics unit **120** in MVCU **110**.

Communication services advisor **178** provides services to telematics unit **120** in MVCU **110**. Services provided by communication services advisor **178** include enrollment services, navigation assistance, real-time traffic advisories, directory assistance, roadside assistance, business or residential assistance, information services assistance, emergency assistance, and communications assistance. Communication services advisor **178** communicate with telematics unit **120** in MVCU **110** through wireless carrier system **140**, communication network **142**, and land network **144** using voice transmissions, or through communication services manager **174** and switch **172** using data transmissions. Switch **172** selects between voice transmissions and data transmissions.

In operation, an incoming call is routed to telematics unit **120** within mobile vehicle **110** from call center **170**. In one embodiment, the call is routed to telematics unit **120** from call center **170** via land network **144**, communication network **142**, and wireless carrier system **140**.

FIG. 2 is a block diagram of a telematics based system in accordance with an embodiment of the present invention. **FIG. 2** shows a telematics based system **200** for managing wireless network information collection utilizing a telematics unit within a telematics equipped mobile vehicle.

In **FIG. 2**, the system includes a mobile vehicle **210** having a telematics unit **220** coupled to one or more vehicle system modules **290** via a vehicle communication bus **212**, a communication network **270**, such as, for example a public switched telephone network (PSTN), and a short-distance communication system (SDCS) **275**. Telematics unit **220** further includes a database **228** that contains programs **231**, stored data **232**, updated data **233** and triggers **234**. Vehicle system module (VSM) **290** further includes a program **291** stored data **292**, and short-distance communication antenna **295**. In one embodiment, VSM **290** is located within telematics unit **220**. In **FIG. 2**, the elements are presented for illustrative purposes and are not intended to be limiting. Telematics based system **200** may include additional components not relevant to the present discussion.

Telematics unit **220** is any telematics device enabled for operation with a telematics service provider, such as, for example telematics unit **120** as described with reference to **FIG. 1**. Telematics unit **220** in vehicle **210** is in communication with communication network **270** (e.g. a "PSTN"). Telematics unit **220** includes volatile and non-volatile memory components for storing data and programs. In one embodiment, memory components in telematics unit **220** contain database **228**.

Database **228** includes one or more programs **231** for operating telematics unit **220**, such as, for managing wireless network information collection utilizing a telematics unit. In operation, program **231** detects at least one wireless short-distance communication network identification signal from short-distance communication system (SDCS) **275** at updated data **233** utilizing a vehicle system module (VSM), such as, for example a wireless modem (described below). Program **231** generates wireless network information based on the at least one detected wireless network identification signals and communicates the generated wireless network information to a service provider via PSTN **270**. Examples of wireless short-distance communication network identification signals include a short message service signal, an IEEE 802.11 standard compliant signal, or a Bluetooth compliant signal.

In one embodiment, detecting at least one wireless short-distance communication network identification signal includes receiving at least one wireless short-distance communication network identification signal from a vehicle system module, determining a unique device identifier associated with each received wireless short-distance communication network identification signal, and storing the determined unique device identifier. In an example, detecting at least one wireless short-distance communication network identification signal includes receiving at least one wireless short-distance communication network identification signal from vehicle system module **290** and caching the network identification signal at updated data **233**, determining a unique device identifier associated with each received wireless short-distance communication network identification signal utilizing program **231**, and storing the determined unique device identifier at stored data **232**. Examples of wireless network information included within the short-distance communication network identification signal are an internet protocol address, an identification tag, location information, such as, GPS coordinates, points of interest, venue capacity, venue size, and category (i.e. restaurant, theater, etc.).

In another embodiment, generating wireless network information based on the at least one detected wireless network identification signals includes associating a GPS coordinate with the detected wireless short-distance communication network identification signal and storing the wireless short-distance communication network identification signal and the associated GPS coordinate. In an example, the GPS coordinate is based on the location of the telematics unit at the time of reception. In another example, the GPS coordinate is included within the at least one wireless short-distance communication network identification signal.

In yet another embodiment, communicating the generated wireless network information to a service provider includes detecting a wireless network information upload trigger and initiating a wireless network information transmission to the service provider responsive to the detected wireless network information upload trigger. In an example, the information upload trigger is included within a signal received at telematics unit **220** from a service provider via PSTN **270**. In another example, the information upload trigger is stored at triggers **234**. In another embodiment, communicating the generated wireless network information to a service provider further includes transmitting the wireless network information to a service provider. In an example, detecting a wireless network information upload trigger includes receiving a wireless network information request and processing the wireless network information request to identify the wireless network information upload trigger.

Vehicle system module (VSM) **290** is any vehicle system control module having software and hardware components for operating, controlling or monitoring one or more vehicle systems. In one embodiment, VSM **290** is a wireless modem, such as, for example wireless modem **124** as illustrated in **FIG. 1**, above. In another embodiment, VSM **290** is a global positioning system (GPS) module, such as, for example GPS unit **126** of **FIG. 1**. In yet another

embodiment, VSM **290** is a controller for controlling a vehicle system such as, for example, a powertrain control module for controlling and monitoring powertrain functions.

Vehicle system module **290** contains one or more processors, one or more memory devices and one or more connection ports. In one embodiment, VSM **290** includes a software switch for scanning received information, such as, for example sensor information to identify that data has been received. VSM **290** is coupled to a vehicle communication bus **212**, and therefore to any other device that is also coupled to vehicle communication bus **212**. The vehicle communication bus is also referred to as a vehicle communication network. In one embodiment, VSM **290** is directly coupled to telematics unit **220**, such as, for example vehicle communication bus **212** coupling telematics unit **220** to vehicle system modules **290**. In an example, vehicle communication bus **212** is a vehicle communication network **112** as described in **FIG. 1**, above. In another embodiment, VSM **290** is indirectly coupled to telematics unit **220**. In yet another embodiment, VSM **290** is coupled to short-distance communication antenna **295**.

VSM **290** includes one or more programs **291** and stored data **292** stored in memory. In one embodiment, program **291** includes software for detecting at least one wireless short-distance communication network identification signal via short-distance communication antenna **295**. In an example, detecting at least one wireless short-distance communication network identification signal includes receiving at least one wireless short-distance communication network identification signal and storing the received wireless short-distance communication network identification signal prior to sending the received wireless short-distance communication network identification signal to telematics unit **220** for processing, such as, for example to generate wireless network information to be communicated to a service provider.

FIG. 3 is a flow diagram of an embodiment of a method of managing wireless network information collection utilizing a telematics unit within a telematics equipped mobile vehicle. In **FIG. 3**, method **300** may utilize one or more systems detailed in **FIGS. 1** and **2**, above. The present invention can also take the form of a computer usable medium including a program for configuring an electronic module within a vehicle. The program stored in the computer usable medium includes computer program code for executing the method steps described in **FIG. 3**. In **FIG. 3**, method **300** begins at step **310**.

At step **320**, at least one wireless short-distance communication network identification signal is detected. In one embodiment, detecting the at least one wireless short-distance communication network identification signal includes receiving at least one wireless short-distance communication network identification signal, determining a unique device identifier associated with each received wireless short-distance communication network identification signal, and storing the determined unique device identifier. Examples of a short-distance communication network identification signal include a short message service signal, an IEEE 802.11 standard compliant signal, and a Bluetooth compliant signal. The short-distance communication network identification signal includes information, such as, for example an internet protocol address, an identification tag, GPS coordinates, points of interest, venue capacity, venue size, and category (i.e. restaurant, theater, etc.). In an example, the determined unique device identifier includes one or more of the aforementioned items.

At step **330**, wireless network information is generated based on the at least one detected wireless network identification signals. In one embodiment, generating wireless network information based on the at least one detected wireless network identification signals includes associating a GPS coordinate with the detected wireless short-distance communication network identification signal and storing the wireless short-distance communication network identification signal and the associated GPS coordinate. In an example, the GPS

coordinate is based on the location of the telematics unit at the time of reception. In another example, the GPS coordinate is included within the at least one wireless short-distance communication network identification signal.

At step **340**, the generated wireless network information is communicated to a service provider. In one embodiment, communicating the generated wireless network information to a service provider includes detecting a wireless network information upload trigger and initiating a wireless network information transmission to the service provider responsive to the detected wireless network information upload trigger. In an example, the information upload trigger is included within a signal received at the telematics unit from a service provider. In another example, the information upload trigger is stored within the telematics unit.

In another embodiment, communicating the generated wireless network information to a service provider further includes transmitting the wireless network information to a service provider. In an example, detecting the wireless network information upload trigger includes receiving a wireless network information request and processing the wireless network information request to identify the wireless network information upload trigger.

At step **350**, the method is terminated.

The above-described methods and implementation for managing wireless network information collection utilizing a telematics unit within a telematics equipped mobile vehicle are example methods and implementations. These methods and implementations illustrate one possible approach for managing wireless network information collection utilizing a telematics unit within a telematics equipped mobile vehicle. The actual implementation may vary from the method discussed. Moreover, various other improvements and modifications to this invention may occur to those skilled in the art, and those improvements and modifications will fall within the scope of this invention as set forth in the claims below.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive.

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